

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 10/622,881 Conf. No. 2745
Applicant : Sunil G. Warrier et al.
Filed : 07/18/2003
TC/A.U. : 1746
Examiner : Robert W. Hodge
Docket No.: 02-510
Cust. No. : 34704

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313

Appeal Brief

Dear Sir:

This brief is submitted in support of the Notice of Appeal
filed on January 27, 2009.

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(i) Real party in interest. The real party in interest for this application is the assignee of record, which is UTC Fuel Cells, L.L.C. In this regard, the assignee has undergone a name change to UTC Power Corporation, and a name change document will be recorded in due course.

(ii) Related appeals and interferences. There are no known related appeals or interferences. This is the second brief on appeal filed in this application, the first one being filed on January 9, 2008 and resulting in a further office action presenting rejections which were made final upon a request for reconsideration and made final, and from which the present appeal is taken.

(iii) Status of Claims.

Claims 1-3, 6, 7, 9-12 and 24-26 are rejected and on appeal.

Claims 4, 22 and 23 are cancelled.

Claim 5 is allowed.

Claim 8 is objected to.

Claims 13-21 are withdrawn.

(iv) *Status of Amendments.* No amendments have been filed subsequent to the final rejection from which this appeal is taken.

(v) *Summary of claimed subject matter.*

Independent claims 1 and 24 are on appeal. The text of these claims is produced below in the Claims Appendix.

Claim 1 calls for a seal assembly (See Figure 1 generally) for a solid oxide fuel cell stack, comprising at least two fuel cells 12, each comprising an electrolyte 16 having a cathode layer 18 on one side and an anode layer 20 on the other side (See specification page 5, lines 22-25), and at least one bipolar plate 14 between the at least two fuel cells (See specification page 5, lines 26-31), the at least two fuel cells and the bipolar plate collectively defining at least two fuel cell components having opposed surfaces (See specification page 6, lines 14-20); and a continuous fiber tow (See specification page 5, lines 12-14) wrapped into a closed-loop structure (See specification page 7, lines 4-6) forming a substantially gas impermeable seal between said opposed surfaces.

Claim 24 calls for a seal assembly (See Figure 1 generally) for a solid oxide fuel cell stack, comprising at least two fuel cells 12 each comprising an electrolyte 16 having a cathode layer 18 on one side and an anode layer 20 on the other side (See specification page 5, lines 22-25), and at least one bipolar plate 14 between the at least two fuel cells (See specification page 5, lines 26-31), the at least two fuel cells and the bipolar plate collectively defining at least two fuel cell components having opposed surfaces (See specification page 6, lines 14-20); a continuous fiber tow (See specification page 5, lines 12-14) wrapped into a closed-loop structure (See specification page 7, lines 4-6) forming a substantially gas impermeable seal between said opposed surfaces; and a compression stop 50 disposed between said opposed surfaces of said fuel cell stack components (See specification page 6, lines 3-7).

(vi) Grounds of rejection to be reviewed on appeal.

The sole ground of rejection on appeal is whether claims 1-3, 6, 7, 9-12 and 24-26 are obvious over a combination of US publication 2003/0215689 to Keegan (hereafter "Keegan") in view of US 6,139,810 to Gottzmann (hereafter "Gottzmann").

(vii) Argument.

In the final office action from which appeal is taken, the Examiner rejected independent claims 1 and 24 as obvious over a combination of Keegan and Gottzmann.

Independent claim 1 calls for a bipolar plate between two fuel cells, wherein the bipolar plate and at least one of the fuel cells define opposed surfaces. Claim 1 further requires a continuous fiber tow in a closed loop structure forming a substantially gas impermeable seal between the opposed surfaces.

Keegan is clearly deficient in teaching the seal as called for by claims 1 and 24. Keegan teaches a solid oxide fuel cell with a seal 80 that is either a continuous bead of material or a gasket, and the preferred teaching in Keegan is that the seal is a metal foam. None of these teachings is a continuous fiber tow wrapped into a closed-loop structure as claimed in claims 1 and 24. The Examiner concedes that Keegan does not teach the fiber portion of the claim language, and relies upon Gottzmann as teaching this seal.

As previously pointed out, Gottzmann is both non-analogous art and, furthermore, contains teaching concerning the seal that make the seal incompatible with the teachings of Keegan.

In connection with the argument that Gottzman is non-analogous art, the Examiner argues that Keegan and Gottzman are addressing the same problem. This is not true. Keegan uses a seal to seal between SOFC components which are compressed together on opposite sides of the seal to prevent flow from escaping from between two components which are fixed relative to each other.

Gottzman, on the other hand, teaches an O-ring seal which is used to provide a sliding seal between a tube and a plate through which the tube passes. The seal is not directly compressed between the components to be sealed, but rather is compressed in a

transverse direction by a collar which then presses the O-ring against the tube. The mechanics of the seal in Keegan and the seal in Gottzman are so strikingly different that it is submitted that a person of skill in the art would not at all consider the two teachings to be addressing the same problem. Based upon the foregoing, it is submitted that the combination of Keegan and Gottzman to reject claims 1 and 24 is not proper and should be reversed.

In addition, it is submitted that Gottzman actually teaches away from the present disclosure, as a seal which provides a free sliding seal between a tube and a plate through which the tube passes is not at all the environment of use of the seal of Keegan and, for that matter, the claims of the present application.

Still further, Gottzman teaches his seal in the context of a tube and shell reactor, and there is nothing to lead a person of skill in the art to believe that such a seal would be useful in the very different environment of a SOFC. The reaction conditions, reactants themselves, and components between which a seal is desired are all completely different between Gottzman and an SOFC.

Gottzmann does not disclose a solid oxide fuel cell stack with at least two fuel cell components and a continuous fiber tow wrapped into a closed-loop structure forming a substantially gas impermeable seal between opposed surfaces of the components. Rather, in a completely different environment, Gottzmann discloses an O-ring 50 which is between tube sheet 21, outer wall 54 of reaction tube 54, and a sleeve flange 58. None of these structures remotely resembles the structures which define the opposed surfaces as recited in claims 1 and 24. Further, none of the structures or teachings in Gottzmann are remotely related to the teachings of Keegan. There is nothing in either teaching that would lead a person skilled in the art to believe that the sliding seal of

Gottzman's tube and shell reactor could be incorporated in a different manner than is taught in Gottzman into an SOFC such as that taught by Keegan with any expectation of success.

Based upon the foregoing, it is clear that the rejection is improper and should be reversed.

Independent claim 24 calls for similar subject matter and further adds a compression stop disposed between the two opposed surfaces. Thus, the above rationale supports claim 24 as well. In addition, the Examiner states that Gottzmann teaches a compression stop extending from one of the fuel cell components to another fuel cell component and that this compression stop is frame like in shape and has a groove to hold the seal member. The Examiner refers to Figures 1-4 and column 7, line 8 to column 10, line 35, of Gottzmann.

First, it is pointed out that the Gottzmann device is not at all a fuel cell and, therefore, that it is not possible for Gottzmann to have fuel cell components between which a compression stop could be located.

Second, if the Examiner considers the recess illustrated in Figure 4 of Gottzmann to meet the limitations of claim 24, it should be appreciated that this structure is completely incompatible with incorporation into Keegan. Further, Gottzmann positions the O-ring between circular concentric surfaces in Figure 4, which do not at all resemble the surfaces called for by claim 24. In short, it is submitted that there is no suggestion to combine Keegan with Gottzmann, no teaching that indicates how a person skilled in the art should do such combining, and a clear inconsistency between the structures of Keegan and Gottzmann which leads to the inescapable conclusion that a person of skill in the art would not consider Gottzmann as teaching anything pertinent to the claims of the present application or the teachings of Keegan.

Reversal of the rejection of claim 24 is therefore earnestly solicited.

Dependent claims 2, 3, and 6-7 and 9-12 all depend from claim 1 and should be allowed based upon this dependency and also in their own right. Dependent claims 25-26 depend from claim 24 and should be allowed based upon this dependency as well.

In addition, claims 25 and 26 call for a frame, and for the opposed surfaces to be substantially planar with the compression stop extending from one of the substantially planar surfaces. Neither of Keegan nor Gottzmann discloses the frame. Further, positioning of the compression stop between two substantially planar surfaces more clearly highlights the incompatibility of the teachings of Keegan and Gottzmann, and is yet another feature which must be totally ignored from Gottzmann in order to arrive at the subject matter of claim 26.

(viii) Claims Appendix.

1. A seal assembly for a solid oxide fuel cell stack, comprising:

at least two fuel cells each comprising an electrolyte having a cathode layer on one side and an anode layer on the other side, and at least one bipolar plate between the at least two fuel cells, the at least two fuel cells and the bipolar plate collectively defining at least two fuel cell components having opposed surfaces; and

a continuous fiber tow wrapped into a closed-loop structure forming a substantially gas impermeable seal between said opposed surfaces.

2. The apparatus according to claim 1, wherein said seal comprises a stable oxide ceramic.

3. The apparatus according to claim 1, wherein said seal comprises at least one material selected from the group consisting of alumina, magnesia, zirconia, mullite, yttrium aluminum garnate, magnesium silicate and combinations thereof.

4. (canceled)

5. (Allowed and not on appeal) A seal assembly for a solid oxide fuel cell stack, comprising:

at least two fuel cell components having opposed surfaces; and a seal member disposed between said surfaces, wherein said seal member comprises one or more substantially continuous fibers, and wherein said fibers are impregnated with Ag_2O .

6. The apparatus of claim 1, wherein said seal is impregnated with at least one metal selected from the group consisting of Ni, Cr, Ag, Cu, Fe, Al and combinations thereof.

7. The apparatus of claim 1, wherein said seal is impregnated with at least one material selected from the group consisting of alumina, zirconia, yttria aluminum garnate, magnesium silicate and combinations thereof.

8. (Allowable and not on appeal) The apparatus of claim 1, wherein said seal is impregnated with Ag₂O.

9. The apparatus of claim 1, wherein said seal comprises at least a first fiber in a substantially concentric relationship with a second fiber.

10. The apparatus of claim 9, wherein said at least two fuel cell components comprise a separator plate and a fuel cell with said seal disposed therebetween.

11. The apparatus of claim 1, further comprising a compression stop extending from at least one of said fuel cell components toward the other of said fuel cell components and defining thereon at least one of said opposed surfaces and having a groove for receiving said seal member.

12. The apparatus of claim 11, wherein said seal has a height and said groove has a depth, and wherein said height is greater than said depth whereby said seal in said groove can be compressed between said opposed surfaces.

13. (withdrawn) A seal member for a solid oxide fuel cell stack, comprising one or more substantially continuous fibers.

14. (withdrawn) The seal member of claim 13, wherein said seal is defined by multiple loops of said substantially continuous fibers.

15. (withdrawn) The seal member of claim 14, wherein said at least one substantially continuous fiber defines said multiple loops, and wherein end portions of said substantially continuous fibers are wrapped around said multiple loops.

16. (withdrawn) The seal member according to claim 13, wherein at least one of said substantially continuous fibers comprises a stable oxide ceramic.

17. (withdrawn) The seal member according to claim 13, wherein at least one of said substantially continuous fibers comprises a material selected from the group consisting of alumina, zirconia, yttria aluminum garnate, magnesium silicate and combinations thereof.

18. (withdrawn) The seal member according to claim 13, wherein at least one of said substantially continuous fibers comprises an elongate compressible member having a structure selected from the

group consisting of tows, yarns, woven fibers and combinations thereof.

19. (withdrawn) The seal member according to claim 13, wherein said seal member is impregnated with a plurality of particles.

20. (withdrawn) The seal member according to claim 19, wherein said particles comprise at least one metal selected from the group consisting of Ni, Cr, Ag, Cu, Fe, Al and combinations thereof.

21. (withdrawn) The seal member according to claim 13, wherein said fibers are impregnated with Ag₂O.

22. (canceled)

23. (canceled)

24. A seal assembly for a solid oxide fuel cell stack, comprising:

at least two fuel cells each comprising an electrolyte having a cathode layer on one side and an anode layer on the other side, and at least one bipolar plate between the at least two fuel cells, the at least two fuel cells and the bipolar plate collectively defining at least two fuel cell components having opposed surfaces;

a continuous fiber tow wrapped into a closed-loop structure forming a substantially gas impermeable seal between said opposed surfaces; and

a compression stop disposed between said opposed surfaces of said fuel cell stack components.

25. The apparatus of claim 24, further comprising a frame situated between said opposed surfaces, wherein said frame is located adjacent one opposed surface, and wherein said compression stop is disposed on said frame.

26. The apparatus of claim 24, wherein said opposed surfaces comprise substantially planar surfaces, and wherein said compression stop extends from one of said substantially planar surfaces toward the other of said substantially planar surfaces.

(ix) Evidence appendix - None

(x) Related proceedings appendix - None

(xi) Fees authorization and signature.

This paper is accompanied by authorization for a deposit account to pay for an extension of time. Since the fee for filing an appeal brief was previously paid in connection with the brief files on January 9, 2008, it is believed that no appeal brief fee is due. If such a fee is due, please charge same to Deposit Account 02-0184. It is believed that no other fee is due in connection with this paper. If any such fee is due, please charge same to Deposit Account 02-0184.

Respectfully submitted,
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